What is Claimed is:

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1. A friction transmission unit having an input member and an output member in rolling contact with the input member, for transmitting rotation of the input member to the output member by means of friction force,

wherein

a profile defined by a function indicating a gap z which is formed between the input member and the output member when the input member and the output member are assumed to contact each other through an applied load 0 is a profile other than a circular arc profile, the gap z being on a plane vertical to a vector indicating friction force caused between the input member and the output member,

the profile other than a circular arc profile is defined by a shape of contact stress distribution which monotonically decreases in areas near edges of a contact region on the plane vertical to a vector indicating the friction force, the shape of contact stress distribution being a shape formed when a substantially rated load is applied to the input member and the output member, and

the contact stress monotonically decreases in areas near edges of a contact region.

2. The friction transmission unit according to claim 1, wherein the contact stress is substantially constant at and around the

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3. A friction transmission unit having an input member and an output member in rolling contact with the input member, for transmitting rotation of the input member to the output member by means of friction force,

wherein,

a function indicating a gap z which is formed between the input member and the output member when the input member and the output member are assumed to contact each other at a point, the gap z being on a plane vertical to a vector indicating friction force caused between the input member and the output member, is expressed as

$$z = a \cdot \sinh(bx^2)$$

x being a distance from the point at which the input member is assumed to contact the output member along a tangent passing through the point.

4. A friction transmission unit having an input member and an output member in rolling contact with the input member, for transmitting rotation of the input member to the output member by means of friction force,

wherein,

a function indicating a gap z which is formed between the input member and the output member when the input member and the output member are assumed to contact each other at a point, the

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gap z being on a plane vertical to a vector indicating friction force caused between the input member and the output member, is expressed as

$$z = C_4x^4 + C_3x^3 + C_2x^2$$

wherein
$$C_4 = (-0.00002n^4 + 0.0017n^3 - 0.058n^2 + 0.89n - 2.113) \times C_0$$
$$C_3 = (-0.0018n^3 + 0.064n^2 - 1.0754n + 3.7603) \times C_0$$
$$C_2 = (1.894n^{-0.574} - C_4 - C_3) \times C_0$$
$$C_0 = \frac{2aP\max}{\pi E}$$
$3 \leqq n \leqq 6$ (full-troidal)
$3 \leqq n \leqq 10$(half-troidal)

x being a distance from the point at which the input member is assumed to contact the output member along a tangent passing through the point.

5. A method for designing a friction transmission unit comprising an input member and an output member which are in rolling contact with each other, in which fluid is supplied at and around a point of contact between the input member and the output member so that power is transmitted by means of rolling and slipping of the input member and the output member and by means of shearing of the fluid, the method comprising:

a function computing step of computing a function indicating a gap z which is formed between the input member and the output member when the input member and the output member are assumed to contact each other at one point, the gap z being on a plane vertical to a vector indicating friction force caused between the

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input member and the output member; and

a step of obtaining a profile of contact surfaces of the input member and the output member based on the function indicating the gap z, wherein,

the function computing step includes a contact stress distribution computing step of computing contact stress distribution at and around the point of contact between the input member and the output member and a transmission loss based on high pressure shearing characteristics of the fluid to select a contact stress distribution having a shape which substantially minimizes the transmission loss, and a step of computing a function indicating the gap z which realizes the contact stress distribution selected based on an elastic dynamic expression.

6. The method for designing a friction transmission unit according to claim 5, wherein, at the function computing step of computing the function indicating the gap z, the function indicating the gap z is computed by approximating a function

$$z = C_4 x^4 + C_3 x^3 + C_2 x^2$$

wherein

$$C_4 = (-0.00002n^4 + 0.0017n^3 - 0.058n^2 + 0.89n - 2.113) \times C_0$$

$$C_3 = (-0.0018n^3 + 0.064n^2 - 1.0754n + 3.7603) \times C_0$$

$$C_2 = (1.894n^{-0.574} - C_4 - C_3) \times C_0$$

$$C_0 = \frac{2aP\max}{\pi E}$$

$3 \leqq n \leqq 6$ (full-troidal)

$3 \leqq n \leqq 10$ (half-troidal)

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7. A method for designing a friction transmission unit having an input member and an output member in rolling contact with the input member, for transmitting rotation of the input member to the output member by means of friction, comprising:

a step of obtaining a point of contact between the input member and the output member where a curvature radius of at least one of the input member and the output member in a direction along a vector indicating friction force between the input member and the output member is minimized; and

a step of computing, at the point of contact obtained, a function indicating a gap z which is formed between the input member and the output member when the input member and the output member are assumed to contact each other as being applied by a load 0, the gap z being on a plane vertical to a vector indicating friction force caused between the input member and the output member.

8. The method for designing a friction transmission unit according to claim 7, wherein at least one of contact surfaces of the input member and the output member is a troidal surface, and the function is obtained at a point of contact which is innermost in a radius direction of rotation within a range wherein the other member contacts the contact surface.

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